इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 2121-1 (1981): Conductors and earth wire accessories for overhead power lines, Part 1: Armour rods, binding wires and tapes for conductors [ETD 37: Conductors and Accessories for Overhead Lines]

“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS : 2121 (Part I) - 1981

(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR CONDUCTORS AND EARTH WIRE ACCESSORIES FOR OVERHEAD POWER LINES

PART I ARMOUR RODS, BINDING WIRES AND TAPES FOR CONDUCTORS

(First Revision)

Fourth Reprint JANUARY 1999

UDC 621.315.65:621.315.171

© *Copyright* 1981

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *August* 1981

Indian Standard

SPECIFICATION FOR CONDUCTORS AND EARTH WIRE ACCESSORIES FOR OVERHEAD POWER LINES

PART I ARMOUR RODS, BINDING WIRES AND TAPES FOR CONDUCTORS

(First Revision)

Conductors and Accessories for Overhead Lines Sectional Committee, ETDC 60

Chairman	*Representing*
Shri R. D. Jain	Rural Electrification Corporation Ltd, New Delhi
Members	
Shri G. L. Dua (*Alternate* to Shri R. D. Jain)	
Additional General Manager (IT)	Indian Posts & Telegraphs Department, New Delhi
Divisional Engineer (Tele) E (*Alternate*)	
Shri V. K. Agarwal	Tata Hydro-Electric Power Supply Co Ltd, Bombay
Shri P. P. Bhisey (*Alternate*)	
Shri R. S. Arora	Directorate General of Supplies and Disposals, New Delhi
Shri J. S. Passi (*Alternate*)	
Shri S. Bhattacharya	Indian Cable Co Ltd, Calcutta
Shri T. Singh (*Alternate*)	
Shri R. T. Chari	Tag Corporation, Madras
Shri A. Arunkumar (*Alternate*)	
Shri S. D. Dand	Kamani Engineering Corporation Ltd, Bombay
Shri R. V. S. Manian (*Alternate*)	
Director (Transmission)	Central Electricity Authority (Transmission Directorate), New Delhi
Deputy Director (Transmission) (*Alternate*)	

(*Continued on page* 2)

© *Copyright* 1981

BUREAU OF INDIAN STANDARDS

This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(*Continued from page* 1)

Members	*Representing*
Director (T-I), RDSO	Ministry of Railways
Joint Director (T-I)-I (*Alternate*)	
Shri M. M. Goel	Haryana State Electricity Board, Chandigarh
Shri P. K. Aggarwal (*Alternate*)	
Shri P. Jayaraman	Tamil Nadu Electricity Board, Madras
Shri Devadasan Edward (*Alternate*)	
Shri M. K. Jhunjhunwala	Cable and Conductor Manufacturers' Association of India, New Delhi
Shri B. K. Aich (*Alternate*)	
Shri I. S. Kalra	Bhakra Beas Management Board, Chandigarh
Shri Inderjit Bhatia (*Alternate*)	
Shri R. C. Khanna	Delhi Electric Supply Undertaking, New Delhi
Shri M. K. Ahuja (*Alternate*)	
Shri O. P. Mathur	Electrical Manufacturing Co Ltd, Calcutta
Shri S. K. Mukherjee	National Test House, Calcutta
Shri U. S. Verma (*Alternate*)	
Shri V. R. Narasimhan	Central Power Research Institute, Bangalore
Shri T. V. Gopalan (*Alternate*)	
Shri H. K. Rathi	Maharashtra State Electricity Board, Bombay
Shri V. N. Rikh	U. P. State Electricity Board, Lucknow
Shri M. B. Alimchandani (*Alternate*)	
Shri R. D. Sheth	Electro-Metal Industries, Bombay
Shri V. Venugopalan (*Alternate*)	
Shri D. Sivasubramaniam	Aluminium Industries Ltd, Kundara
Shri K. M. Jacob (*Alternate*)	
Prof M. Venugopal	Indian Institute of Technology, Madras
Prof Y. Narayana Rao (*Alternate*)	
Shri S. P. Sachdev, Director (Elec tech)	Director General, ISI (*Ex-officio Member*)

Secretary

Shri Sukh Bir Singh
Assistant Director (Elec tech), ISI

Indian Standard

SPECIFICATION FOR CONDUCTORS AND EARTH WIRE ACCESSORIES FOR OVERHEAD POWER LINES

PART I ARMOUR RODS, BINDING WIRES AND TAPES FOR CONDUCTORS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part I) (First Revision) was adopted by the Indian Standards Institution on 21 April 1981, after the draft finalized by the Conductors and Accessories for Overhead Lines Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 The use of ACSR and all aluminium conductors for power transmission is now well established. As a natural consequence, special types of fittings are required to be used for such power lines. This standard has been prepared with a view to ensuring uniform requirements of the various types of such fittings and providing necessary guidance to the manufacturers and the buyers.

0.3 Of the fittings that are used in overhead power lines, anchor clamps and suspension clamps are two which could be considered either as conductor fittings or insulator fittings. Indian Standard specification on insulator fittings has been published separately. To avoid duplication, these two types of fittings have been included in the Indian Standard on insulator fittings.

0.4 This standard was first published in 1962. This revision has been undertaken to upgrade many of essential performance requirements for the fittings used on overhead power lines. In the revised standard various types of fittings used on overhead lines will be covered in the following three parts:

Part I	Armour rods, binding wires and tapes for conductors;
Part II	Mid-span joints and repair sleeves for conductors; and
Part III	Accessories for earth wire.

0.5 If agreed between the purchaser and the supplier the conductor and earth wire accessories may also be made suitable for application for hot line techniques.

0.6 In the preparation of this standard assistance has been derived from BS 3288: Part I: 1973 'Specification for insulator and conductor fittings for overhead power lines: Part I Performance and general requirements' issued by the British Standards Institution.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part I) covers performance and general requirements for preformed armour rods, aluminium binding wires and flat tapes employed on overhead power lines using ACSR, all aluminium and aluminium alloy conductors.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Acceptance Tests — Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

2.2 Failing Load — The greatest load which can be applied to a fitting under the prescribed conditions of test.

2.3 Mechanical Protective Fittings — Any auxiliary device attached to a conductor for its mechanical protection.

2.4 Routine Tests — Tests carried out on each fitting to check the requirements which are likely to vary during production.

2.5 Specified Minimum Failing Load — The greatest load specified by the purchaser or declared by the supplier, which can be applied to a fitting under the prescribed conditions of test.

---

*Rules for rounding off numerical values (*revised*).

2.6 Type Test — Tests intended to prove that the quality and design of a given type of article are in accordance with the specification.

3. CONSTRUCTION AND GENERAL REQUIREMENTS

3.0 General

3.0.1 Aluminium and aluminium alloys, having required mechanical strength, corrosion resistance and machinability depending on the types of applications for which the accessories are used, shall be employed in the manufacture of the accessories. The composition of the aluminium alloys used shall be made available to the purchaser if required for verification.

3.0.2 Fittings intended to connect conductors of two dissimilar metals shall be designed to avoid harmful bimetallic corrosion when erected in accordance with manufacturer's recommendations.

3.0.3 All fittings shall be so designed that the effects of vibration, both on the conductor and the fitting itself, are minimized.

3.0.4 In case of rods, wires or tapes, no joint shall be permitted except those in the base rod or wire before final drawing.

3.1 General Requirements for Armour Rods

3.1.1 Preformed armour rods are factory formed rods made of suitable material, compatible with the conductor on which they are applied. Such rods are formed in helical shape to make them convenient to apply on the conductor without excessive clamping pressure at any one point. The parameters of the armour rods are designed to suit the specific size of the conductors.

3.1.2 Each rod shall be marked with an indelible and distinct type of colour code in the middle to facilitate its identification and application on the conductor.

3.2 General Requirements for Binding Wire and Tape

3.2.1 The wire or tape shall be clean, smooth and free from harmful defects.

4. MATERIAL

4.1 For Armour Rods — The material of armour rods shall be as follows:

a) For aluminium conductors:

Aluminium alloy rods, alloy designation	:	65032 in accordance with IS : 739-1966*
Minimum ultimate strength	:	35 kg/mm^2
Conductivity	:	39 percent of IACS

b) For steel conductors:

Galvanized steel wire	:	—
Minimum ultimate strength	:	134 kg/mm^2

4.2 For Binding Wires and Tapes

4.2.1 The material shall be aluminium with impurities limited as follows:

Copper	Not more than 0·04 percent
Copper + Silicon + Iron	Not more than 0·5 percent

4.2.2 The material shall be supplied in the annealed condition.

5. DIMENSIONAL REQUIREMENTS

5.1 For Armour Rods

5.1.1 Preformed armour rods shall be designed for the specific conductor sizes on a special purpose forming machine which shall convert the rod into the helical form having uniform pitch length and inside diameter. The lay of the helix shall be right hand. The rods shall be subsequently cut to size in uniform lengths. A number of such rods shall form a set which shall be taped together for application on the conductor.

5.1.2 The diameter and number of armour rods per set to be used on different sizes of conductors shall be as given in Table 1.

5.1.3 *Tolerances on Armour Rods*

5.1.3.1 The tolerance on the diameter of armour rods before forming shall be $^{+0·0}_{-0·1}$ mm.

5.1.3.2 The tolerance on the length of the armour rod shall be as given in Table 2.

---

*Wrought aluminium and aluminium alloys, wire (for general engineering purposes) (*revised*).

TABLE 1 SIZES OF ARMOUR RODS

(*Clause* 5.1.2)

Conductor Dia	Particulars of Armour Rods	
	Rod Dia	No. of Rods per Set
(1)	(2)	(3)
mm	mm	
4·47 4·50	2·59	7
5·88	3·07	8
6·27 6·33 6·63	3·71	7
7·68 7·77	3·71	8
9·30	3·71	9
9·93 10·05	4·24	9
12·27 12·30	4·24	10
13·17 13·25	4·24	11
14·15	4·62	11
15·90 17·43	4·62	12
18·13	5·18	12
19·95 20·16 21·00	6·35	11
23·25	6·35	13
26·88 27·44 28·62 28·71	7·87	12
31·68 31·77 31·95 33·12	9·27	12

TABLE 2 TOLERANCES ON THE LENGTH OF ARMOUR RODS

(*Clause* 5.1.3.2)

Individual Rods		Armour Rods Set	
*Specified Shop Length	Tolerance	Specified Shop Length	Difference Between the Longest and the Shortest Rod
(1)	(2)	(3)	(4)
mm	mm	mm	mm
Up to 1 270	+ 0 − 25·5	Up to 1 270	9·5
1 271-1 905	+ 0 − 38	1 271-1 905	13·0
1 906-2 540	+ 0 − 51	1 906-2 540	16·0
		2 541-3 175	19·0
		3 176-3 810	22·0
		3 811-4 445	25·5
		4 446-5 080	28·6
		over 5 080	35·0

*Measured length from end to end after the rods are helically formed.

5.1.4 *Flattening* — Flattening is defined as the difference between the largest and the smallest diameter at a given point. Flattening of the preformed rod shall not exceed 2 percent of the nominal specified diameter after forming or 0·1 mm whichever is larger.

5.1.5 *End Treatment* — The ends of the armour rods shall be deburred, ball ended or parrot bill ended depending on the users requirements for the specific size. The parrot bill ended rod shall have slighly inward (towards the conductor) curvature at the ends so that the edge of the parrot bill end closely grips and rests on the conductor surface and does not remain in the air creating Corona/RIV problems. The ends of the rods shall be buffed for improved electrical performance.

5.2 Binding Wires and Tapes — The dimensions of the wires and tapes shall be as specified in the supply order.

6. PACKING AND MARKING

6.1 Every coil or set of armour rods shall be securely tied with not less than 3 binders and shall be attached with a suitable label.

6.1.1 The label shall carry the following information:

a) Manufacturer's name and/or trade-mark,
b) Size of wire or tape,
c) Net weight,
d) Month and year of manufacture, and
e) Any other markings as agreed to between the manufacturer and the user.

6.2 BIS Certification Marking

The product may also be marked with Standard Mark.

6.2.1 The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7. TESTS

7.1 Classification of Tests

7.1.1 *Type Tests* — The following shall constitute the type tests:

a) Visual examination (*see* **7.2**);
b) Verification of dimensions (*see* **7.3**);
c) Tensile strength test (*see* **7.4**);
d) Electrical resistance test (for armour rods only) (*see* **7.5**);
e) Wrapping test (for binding wires and tapes only) (*see* **7.6**);
f) Slip strength test (for armour rods only) (*see* **7.7**);
g) Radio interference voltage test (for armour rods only) (*see* **7.8**);
h) Corona test (for armour rods only) (*see* **7.9**);
j) Bend test (*see* **7.10**); and
k) Resilient test (for armour rods only) (*see* **7.11**).

7.1.1.1 List of type tests applicable in the case of armour rods and binding wires and tapes are indicated in Table 3.

7.1.1.2 The manufacturer shall submit not less than three samples identicals in all respects for carrying out type tests along with the certificate giving materials and dimensional details of the product.

TABLE 3 LIST OF TYPE TESTS

(*Clause* 7.1.1.1)

Sl No.	Tests	Ref to Clause No.	
		For Armour Rods	For Binding Wires and Tapes
(1)	(2)	(3)	(4)
i)	Visual examination	7.2	7.2
ii)	Verification of dimensions	7.3	7.3
iii)	Tensile strength test	7.4.1	7.4.2
iv)	Electrical resistance test	7.5	*
v)	Wrapping test	*	7.6
vi)	Slip strength test	7.7	*
vii)	Radio interference voltage test	7.8	*
viii)	Corona test	7.9	*
ix)	Bend test	7.10.1	7.10.2
x)	Resilient test	7.11	*

*Test not applicable.

7.1.2 *Acceptance Tests* — The following shall constitute the acceptance tests:

a) Visual examination (*see* **7.2**);
b) Verification of dimensions (*see* **7.3**);
c) Tensile strength test (*see* **7.4**);
d) Electrical resistance test (*see* **7.5**);
e) Wrapping test (for binding wires and tapes only) (*see* **7.6**); and
f) Slip strength test (armour rods only) (*see* **7.7**).

7.1.2.1 The sampling procedure and criteria of acceptance shall be subject to agreement between the supplier and the purchaser. In the absence of such an agreement the sampling procedure detailed in Appendix A may be followed.

7.1.3 *Routine Tests* — The following shall constitute the routine tests:

a) Visual examination (*see* **7.2**); and
b) Verification of dimensions (*see* **7.3**).

7.2 Visual Examination — All fittings shall be checked visually for good workmanship and smooth finish.

7.3 Verification of Dimensions

7.3.1 The dimensions for armour rods shall be checked in accordance with the approved drawings and the requirements given in **5.1**.

7.3.2 The dimensions for binding wire and tapes shall be checked in accordance with the approved drawings and the requirements given in **5.2**.

7.4 Tensile Strength Test

7.4.1 *For Armour Rods* — The testing shall be carried out on a suitable tensile testing machine. The rods shall be straightened by light hammering, for the purpose of this test. The tensile strength of armour rods shall not be less than the values given below:

a) Aluminium alloy rods	35 kg/mm^2
b) Galvanized steel wires	134 kg/mm^2

7.4.2 *For Binding Wires and Tapes* — The test shall be carried out on a suitable tensile testing machine. The elongation shall be measured on the gauge length after the fractured ends have been fitted together, provided that fracture occurs between the gauge marks and not closer than 25 cm to either mark. If the fracture occurs outside these limits and if the required elongation is not obtained, the test shall be discarded and another test made.

7.4.2.1 The tensile strength shall be between 700 to 1 000 kg/cm^2 and the minimum elongation shall be 15 percent on 25 cm gauge length. For this test a tensile load equal to one-half of the minimum breaking load shall be applied at a steady rate.

7.5 Electrical Resistance Test (for Armour Rods only) — The test shall be made on armour rods with dc or ac at any convenient power frequency. The armour rods shall be straightened by light hammering and the electrical connections shall be so made that effective contact is made. The conductivity of the armour rods shall be checked for the requirements given in **4.1**.

7.6 Wrapping Test (for Binding Wires and Tapes only) — The wire or tape shall be wrapped round a wire of its own diameter to form a close helix of eight turns. Six turns shall then be unwrapped and again closely re-wrapped in the same direction as the first wrapping. The wire or tape shall not break when tested so.

NOTE — Slight surface cracks shall not constitute causes for rejection.

7.7 Slip Strength Test (for Armour Rods only) — A set of armour rods shall be applied to the specified conductor and a suspension clamp shall be installed with the recommended bolt torque at the middle of armour rods. The assembly when tested for 'slip strength test' for suspension clamp as per **5.4.1** of IS : 2488 (Part I)-1971* shall withstand a load up to 25 percent of ultimate tensile strength of conductor without the conductor slipping relative to armour rods.

7.8 Radio Interference Voltage Test (Application to Armour Rods for Use on Transmission Lines at 400 kV and Above) — The test shall be conducted in accordance with IS : 8263-1976† simulating the maximum surface voltage gradient as obtained on the line corresponding to 1·1 times the rated phase to ground voltage.

7.9 Corona Test (Application to Armour Rods for Use on Transmission Lines at 400 kV and Above) — The armour rods shall be installed on a bar with diameter equal to conductor dia ± 0·25 mm arranged in a bundle with subconductor spacing as desired by the purchaser. The sample shall then be subjected to 50 Hz phase to ground voltage simulating the maximum surface gradient as obtained on the line corresponding to 80 percent of the rated line voltage. There shall be no evidence of corona on any part of the armoured rods. The corresponding corona inception voltage shall also be recorded.

7.10 Bend Test

7.10.1 *For Armour Rods* — The armour rods shall be wrapped on the conductor as per the standard procedure. The whole assembly should then be bent in such a manner so as to form a semi-circle. The assembly should then remain in this stage for a period of one minute and there should not be any rupture or permanent set when the ends of the test piece are released from the clamping position.

7.10.2 *For Binding Wires and Tapes* — The samples of binding flat tape shall be bent by 180° such that the inner faces touch each other. It shall be then bent in the opposite direction in such a way that the original outer faces touch each other. The sample shall be tested in this way once bent forward, then backward, again forward and backward, and forward for the third time. Finally the tape shall be made straight by bending backward. There shall be no breakage of the tape or any surface cracking.

---

*Specification for insulator fittings for overhead power lines of 3·3 kV and above: Part I General requirements and tests (*first revision*).

†Method for radio interference tests on high-voltage insulators.

7.11 Resilience Test (for Armour Rods only) — A set of preformed armour rods shall be wrapped and then un-wrapped on a piece of conductor five times successively. The preformed armour rods should not lose its resilience even after five applications and should be able to pass through the slip strength test mentioned in **7.7**.

APPENDIX A

(*Clause* 7.1.2.1)

SAMPLING AND CRITERIA FOR CONFORMITY OF ACCEPTANCE TESTS

A-1. LOT

A-1.1 In a consignment, the conductor fittings of the same type and size manufactured in the same factory under similar conditions of production shall be grouped together to constitute a lot.

A-2. SAMPLE SIZE

A-2.1 The number of armour rods to be selected from each lot shall depend upon the size of the lot and shall be in accordance with col 1 and 2 of Table 4.

TABLE 4 SAMPLE SIZE AND ACCEPTANCE NUMBER

LOT SIZE	FOR VISUAL, DIMENSIONAL & ELECTRICAL RESISTANCE TEST		FOR TENSILE STRENGTH SAMPLE SIZE
	Sample Size	Acceptance Number	
(1)	(2)	(3)	(4)
Up to 300	13	0	2
301 to 500	20	1	3
501 to 1 000	32	2	5
1 000 and above	50	3	7

A-2.2 For aluminium binding wires and tapes, the number of coils to be selected from each lot shall be as follows:

Wire Diameter	*Thickness of Flat Armour Tape*	*Sample Size*
Up to and including 1·25 mm	Up to and including 0·8 mm	One coil for 200 kg or part thereof
Above 1·25 mm	Above 0·8 mm	One coil for 500 kg or part thereof

A-2.3 These fittings or coils shall be selected from the lot at random. In order to ensure the randomness of selection, procedures given in IS : 4905-1968* may be followed.

A-3. NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

A-3.1 All the armour rods selected at random in accordance with col 1 and 2 of Table 4, or the coils as selected in **A-2.2** shall be subjected to visual examination, dimensional requirements and electrical resistance test (for armour rods only). An armour rod or coil failing to meet any of the requirements shall be termed as defective. The armour rods in the lot shall be considered as conforming to requirements if the number of defectives is less than or equal to the corresponding acceptance number (*see* col 3 of Table 4). The lot of binding wires or tapes shall be considered as conforming to these requirements if no defective coil is found in the sample.

A-3.2 The lot which has been found as conforming to the above requirements shall then be tested for tensile strength and slip strength test in the case of armour rods and for wrapping test for binding wires or tapes. For armour rods, the sample size shall be in accordance with col 1 and 4 of Table 4. For binding wires or tapes the sample size shall be obtained by cutting one test piece from each of the coils selected in **A-2.2**. The test pieces shall not be annealed or mechanically worked except for straightening before testing. The lot shall be considered as conforming to these requirements if no defective coil is found in the sample.

A-3.3 For slip strength test, three sets of armour rods shall be taken at random and the test shall be carried out on them. The lot shall be considered as conforming to the requirements, if no defective is found.

A-3.4 The lot shall be considered as conforming to the requirements of acceptance tests if **A-3.1**, **3.2** and **A-3.3** are satisfied.

---

*Methods for random sampling.

BUREAU OF INDIAN STANDARDS

Headquarters:
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones: 323 0131, 323 3375, 323 9402 **Fax** :+ 91 11 3234062, 3239399, 3239382
E - mail : bisind @ del 2.vsnl.net.in **Internet** : http://wwwdel.vsnl.net.in/bis.org

Central Laboratory :	***Telephone***
Plot No. 20/9, Site IV, Sahibabad Industrial Area, Sahibabad 201010	91-77 00 32
Regional Offices:	
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002	323 76 17
*Eastern : 1/14 CIT Scheme VII, V.I.P. Road, Kankurgachi, CALCUTTA 700054	337 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43
Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113	235 23 15
†Western : Manakalaya, E9, MIDC, Behind Marol Telephone Exchange, Andheri (East), MUMBAI 400093	832 92 95
Branch Offices:	
'Pushpak', Nurmohamed Shaikh Marg, Khanpur, AHMEDABAD 380001	550 13 48
‡Peenya Industrial Area, 1st Stage, Bangalore-Tumkur Road, BANGALORE 560058	839 49 55
Commercial-cum-Office Complex, Opp. Dushera Maidan, Arera Colony, Bittan Market, BHOPAL 4620160	72 34 52
62/63, Ganga Nagar, Unit VI, BHUBANESHWAR 751001	40 36 27
Kalai Kathir Building, 670 Avinashi Road, COIMBATORE 641037	21 01 41
Plot No. 43, Sector 16 A, Mathura Road, FARIDABAD 121001	91-28 88 01
Savitri Complex, 116 G.T. Road, GHAZIABAD 201001	91-71 19 98
53/5 Ward No.29, R.G. Barua Road, 5th By-lane, GUWAHATI 781003	56 65 08
5-8-56C, L.N. Gupta Marg, Nampally Station Road, HYDERABAD 500001	320 10 84
E-52, Chitaranjan Marg, C- Scheme, JAIPUR 302001	37 38 79
117/418 B, Sarvodaya Nagar, KANPUR 208005	21 68 76
Seth Bhawan, 2nd Floor, Behind Leela Cinema, Naval Kishore Road, LUCKNOW 226005	21 89 23
NIT Building, Second Floor, Gokulpat Market, NAGPUR 440010	52 51 71
Patliputra Industrial Estate, PATNA 800013	26 28 08
Institution of Engineers (India) Building 1332 Shivaji Nagar, PUNE 411005	32 36 35
'Sahajanand House' 3rd Floor, Bhaktinagar Circle, 80 Feet Road, RAJKOT 360002	26 85 86
T.C. No. 14/1421, University P. O. Palayam, THIRUVANANTHAPURAM 695034	32 72 15

---

*Sales Office is at 5 Chowringhee Approach, P.O. Princep Street, CALCUTTA 700072	27 10 85
†Sales Office is at Novelty Chambers, Grant Road, MUMBAI 400007	309 65 28
‡Sales Office is at 'F' Block, Unity Building, Narashimaraja Square, BANGALORE 560002	222 39 71

Printed at : Prabhat Offset Press, New Delhi-2